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Contents

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A TAXONOMIC STUDY OF THE GENUS CHAMAECHAENACTIS RYDBERG (COMPOSITAE)

S. J. Preece, Jr. and B. L. Turner

The genus *Chamaechaenactis* of the tribe Heleniae of the family Compositae contains a single species which grows in the semi-arid foothill regions of the Colorado Plateau in central and eastern Utah, western Colorado, southwestern Wyoming, and northeastern Arizona. This species was described by Eastwood (1891, p. 231) as *Chaenactis scaposa* and was transferred to the newly established genus *Chamaechaenactis* by Rydberg (1906, p. 155). *Chamaechaenactis* has been maintained by most authors since that time, with the exception of Aven Nelson (Coulter and Nelson, 1909, p. 559), who placed *Chaenactis scaposa* in the genus *Actinella* under the name *Actinella carnosa* (the name *Actinella scaposa* was preoccupied). No reason was given for this transfer.

As to the relationships of this entity, Eastwood (op. cit.) in the original description stated:

> "It might perhaps represent a new genus, but it seems better to regard it as an aberrant species of *Chaenactis.*"

Rydberg (op. cit.) in erecting the genus wrote:

> "Miss Eastwood, the discoverer of the plant, referred it to *Chaenactis,* to which it is not closely related, resembling this genus only in the color of the corolla. The structure of the fruit and pappus would place it nearer *Bahia* and *Tetraneuris.*"

Later Rydberg (1914, p. 63) apparently saw other relationships, for in the North American Flora, he placed the genus *Chamaechaenactis* in the subtribe Chaenactidanae instead of in the subtribe Bahianae which contained *Bahia* or in the Tetraneuranae which contained *Tetraneuris.*

Stockwell (1940) in his study of the genus *Chaenactis* made no mention of *Chamaechaenactis* or its relationship to *Chaenactis.* He probably considered *Chamaechaenactis* a "good" genus since he annotated some herbarium sheets as *Chamaechaenactis scaposa* (Eastw.) Rydb.

In the present paper evidence is submitted to indicate that *Chamaechaenactis* has its closest relationship with the genus *Chaenactis,* but should be maintained as a separate genus. In addition a new variety is described based on a detailed study of specimens from a number of herbaria.

The close relationship of *Chamaechaenactis* with *Chaenactis* is at once obvious in the many similarities in total morphology. The flowers of *Chamaechaenactis* are almost duplicated in corolla shape, size, and color by those of many species of *Chaenactis.* The stamens, styles and stigmas of the two genera are much alike, but the latter structures have some significant differ-

(Malvaceae). Rev. Mus. de la Plata ser. 27:111-152.
Madroño, Vol. 12. No. 3, pp. 65-96. July 26, 1953.

ences which will be mentioned later. The general pubescence and appearance of the head and involucral bracts is very similar in the two genera, even to the scarious margins on the inner bracts.

In spite of the many morphological similarities between the two genera, there are conspicuous differences which form a clear break that can be used for generic separation. The most obvious difference is the scapose habit of *Chamaechaenactis* as contrasted to the leafy-stemmed habit of *Chaenactis*. The entire or slightly crenate leaves of *Chamaechaenactis* are quite different from the dissected, pinnate or lobed leaves of *Chaenactis*. An exception to this is *Chaenactis Cusickii* which is a leafy annual with entire leaves. The broad, flattened style branches with distinct stigmatic lines, angled, four-sided achenes, and pappus scales with strong midribs further distinguish *Chamaechaenactis* from *Chaenactis* which has terete style branches, indistinct stigmatic lines, nearly terete achenes, and pappus scales without midribs. Table 1 summarizes the differences between the two genera.

TABLE 1. SUMMARY OF DIFFERENCES BETWEEN CHAENACTIS AND CHAMAECHAENACTIS

Chaenactis	*Chamaechaenactis*
1. Stem leafy.	1. Stem scapose.
2. Pappus scales without midribs.	2. Pappus scales with strong midribs.
3. Leaves mostly lobed, pinnate to highly dissected.	3. Leaves entire or nearly entire.
4. Style branches nearly terete, stigmatic lines indistinct.	4. Style branches broad, flat, stigmatic lines distinct.
5. Achenes nearly terete.	5. Achenes angled, four-sided.

Since clear morphological distinctions exist between the two groups, and since these groups have been treated as "good" genera by most workers after Rydberg, it seems best to consider *Chamaechaenactis* as a separate genus delimited from but closely related to *Chaenactis*.

In respect to the perennial habit, similar actinomorphic flowers, and large number (7-10) of pappus scales, *Chamaechaenactis* might be considered more primitive than most species of *Chaenactis* according to the concepts of Stockwell (1940, p. 94). The entire leaves of *Chamaechaenactis* offer further evidence that this genus branched from the main *Chaenactis* stock rather early.

Seeds of *Chamaechaenactis* were collected in an effort to obtain chromosomal evidence to supplement this morphological study, but they did not germinate. Work along this line is contemplated since many species of *Chaenactis* have been studied cytologically (Stockwell, 1940), and a comparison might prove useful for drawing generic lines and possibly in determining evolutionary relationships.

Taxonomy

Below is presented a taxonomic treatment of the genus based on the information available. The specimens cited are from various herbaria which are referred to by the abbreviations listed in Index Herbariorum, Part 1 (Lanjouw and Stafleu, 1952). The authors wish to express appreciation to the curators of these herbaria for the loan of specimens for this study.

Chamaechaenactis Rydb. Bull. Torrey Club 33:155. 1906.

Caespitose perennial, the whole plant hirsute-canescent; stem 6-8 cm. high, branching underground from a woody root and forming several crowns; leaves all basal, simple, petiole equaling the blade or up to twice as long, blade coriaceous, 8-12 mm. long, oblong to orbicular with an acute to obtuse tip, base cuneate to cordate, margins revolute, entire to crenate, lower surface covered with appressed white hairs, upper surface impressed-punctate and hirsute to nearly glabrous; involucral bracts about 12, in two series, outer ones linear-oblong, obtuse and broad, densely pubescent externally, glabrous with prominent nerves within, inner ones longer and with scarious, colorless to reddish-tipped margins; corolla tubular, regular, flesh-colored, lobes equal; stamens included; style tips broad; achenes clavate, four-sided, and densely villous; pappus of 7-10 nearly equal hyaline scales one-half the length of the achenes and with prominent midribs and erose tips.

Type species: *Chaenactis scaposa.*

Chamaechaenactis scaposa (Eastw.) Rydb. var. **SCAPOSA.** *Chaenactis scaposa* Eastwood, Zoe 2:231. 1891. *Chamaechaenactis scaposa* Rydberg, Bull. Torrey Club 33:155. 1906. *Actinella carnosa* A. Nels. Coulter and Nelson, Man. Rocky Mts. 559. 1909.

Corolla 6.5-9.0 mm. long; pappus 5.0-7.1 mm. long; involucral bracts 13.0-17.0 mm. long; leaf bases mostly truncate to cordate, leaf margins entire to crenate with at least some of the leaves on a plant with crenations, upper leaf surface sparingly hirsute to nearly glabrous, the lower hirsute, petiole 1.2-4.0 cm. long.

Type. On the mesa across the Gunnison River, near Grand Junction, Mesa County, Colorado. May, 1891. *Eastwood* (CAS). Isotype examined (GH).

Distribution. The geographic range of this variety is mainly western Colorado where it occurs in Mesa, Delta, Montrose and San Miguel counties (see fig. 1). One collection was seen from Apache County, Arizona, and one from the La Sal Mountains of Utah. The variety grows in rather sterile, clay soils on foothills of the western slope of the Colorado Rockies between elevations of 5,000 and 7,000 feet.

Material examined. Arizona. Apache County: 15 miles north of Ganado, June 10, 1937, *Peebles 13468* (US). Colorado. Delta County: Uncompahgre Plateau, west of Delta, June 6,

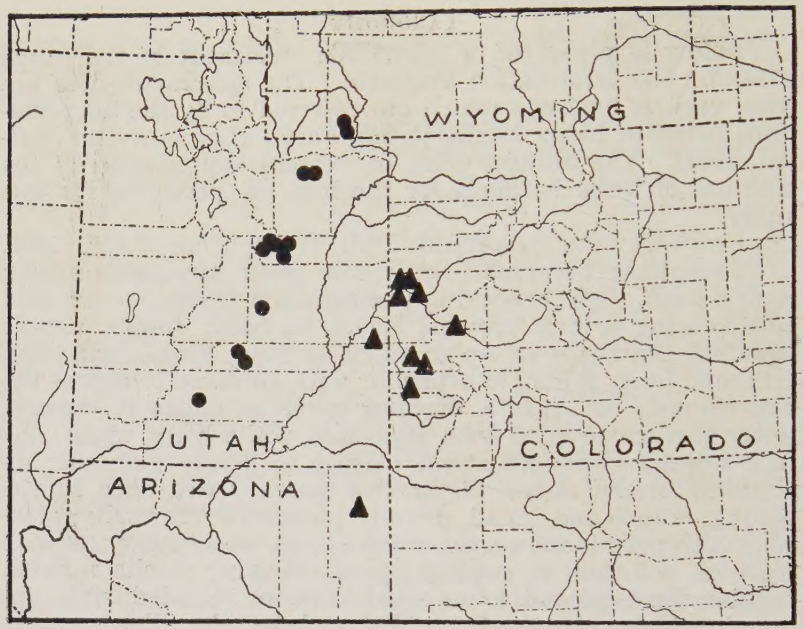


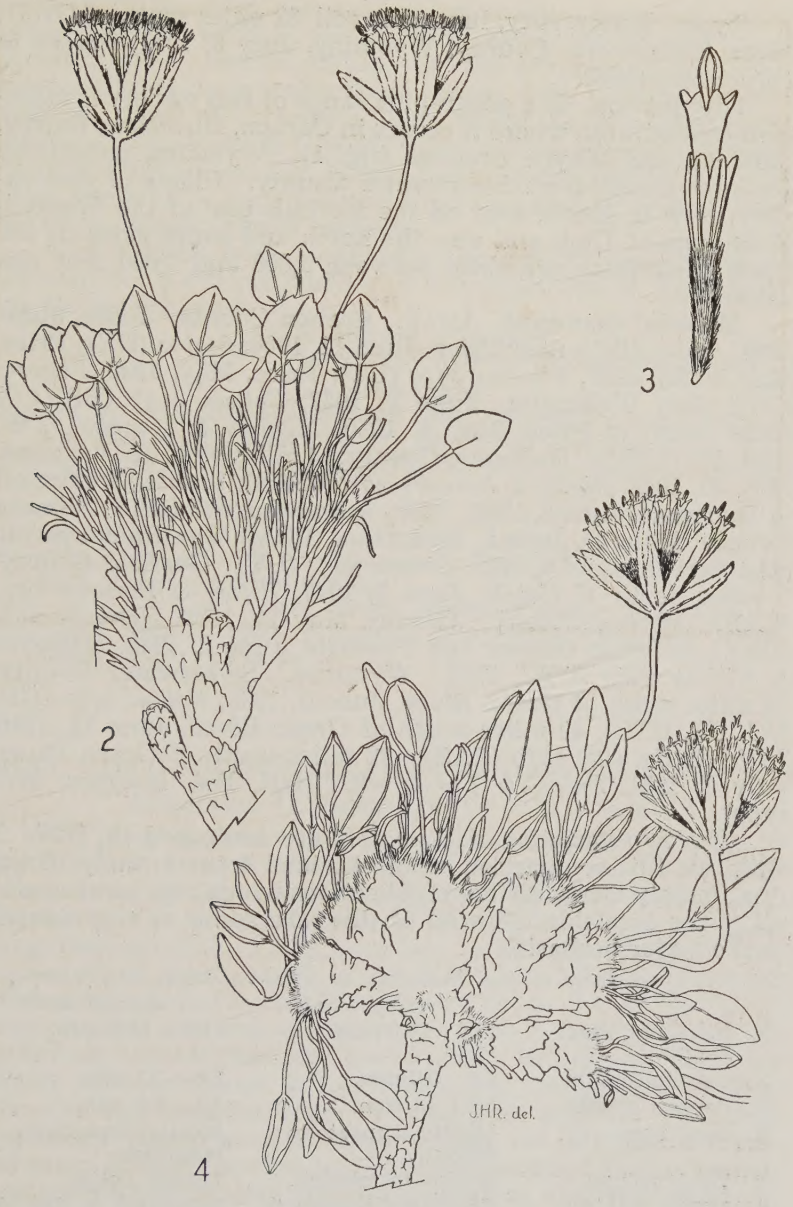
FIG. 1. Distribution of the varieties of *Chamaechaenactis scaposa*. Circles represent *C. scaposa parva*. Triangles represent *C. scaposa scaposa*.

1909, *Tidestrom 2166* (US). Mesa County: Grand Junction, *Eastwood,* May, 1891 (GH, isotype); Grand Junction, *Eastwood,* May, 1892 (GH, POM, UC); foothills, May to July, 1893, *Long* (GH); Gunnison Mesa, Grand Junction, May 15, 1916, *Eastwood 5096* (CAS); hills south of Grand Junction, June 11, 1920, *Osterhout 6016* (POM, RM). Montrose County: Naturita, April 30, 1914, *Payson 267* (GH, MO, RM, WS); Naturita, June 1, 1917, *Payson 988* (MO, RM). San Miguel County: Gypsum Valley, 4 miles UTAH. Grand or San Juan County: La Sal Mts., June 2 (4), 1914, *Jones* (POM, UC).

CHAMAECHAENACTIS SCAPOSA var. **parva** Preece & Turner var. nov.

Corolla 5.5-7.2 mm. long; pappus 4.2-6.3 mm. long; involucral bracts 11.0-13.0 mm. long; leaf bases mostly cuneate to truncate, leaf margins mostly entire, both upper and lower leaf surfaces sparingly to densely hirsute, petiole 1.0-1.8 cm. long.

Herbae perennes, corollis 5.5-7.2 mm. longis, pappo 4.2-6.3 mm. longo; involucri bracteis 11.0-13.0 mm. longis; foliis utrinque plus minusve dense hirsutis, basi plerumque cuneatis usque ad truncatis, marginibus plerumque integris, petiolis 1.0-1.8 cm. longis; aliter similis var. scaposae.



FIGS. 2-4. *Chamaechaenactis scaposa.* 2. Habit sketch of *C. scaposa scaposa,* natural size. Drawn from isotype, *Eastwood* (GH). 3. Same, Single floret, × 2. 4. Habit sketch of *C. scaposa parva,* natural size. Drawn from type, *Preece & Turner* (WS).

Type. Rocky, silty, limestone soil, 32 miles south of Green River, Sweetwater County, Wyoming, July 3, 1951, **Preece** & *Turner 2883* (WS).

Distribution. The geographic range of this variety is mainly in central Utah where it occurs in Carbon, Duchesne, Emery, Garfield, and Wayne counties (fig. 1). Wyoming collections are known only from Sweetwater County. Plants of this variety grow in sterile soils on the foothills east of the Wasatch Mountains of Utah and also the north and south sides of the Uinta Mountains generally between 5,000 and 7,000 feet elevation.

Material examined. UTAH. Carbon County: Price, June, 1898, *Stokes* (UC); near Price, June 11, 1900, *Stokes* (NY); Price, May 2 (12), 1927, *Flowers 1330* (UT); Price, May, 1930, *Flowers* (UT); East Wellington, June 5, 1927, *Cottam 2057* (BRY); 2 miles south of Price, May 9, 1940, *Maguire & Maguire 18260* (GH, NY, UTC). Duchesne County: 3 miles west of Duchesne, May 30, 1942, *Ripley & Barneby 4676* (CAS); 3 miles southwest of Duchesne, June 8, 1946, *Ripley & Barneby 7808* (CAS). Emery County: Mounds, June 5, 1910, *Jones* (POM); San Rafael Swell, East Ferron, June 6, 1932, *Cottam 5254* (UT). Garfield County: 5 miles north of Hatch, June 7, 1947, *Ripley & Barneby 8534* (CAS). Wayne County: Grover, May 11, 1939, *Harrison 9177* (BRY); between Grover and Teasdale, June 3, 1948, *Holmgren & Nielsen 7760* (UTC, WS). WYOMING. Sweetwater County: 25 miles south of Green River, June 3, 1938, *Rollins 2259* (GH, UC, US, UTC); 29 miles south of Green River, June 12, 1946, *Ripley & Barneby 7879* (CAS): 32 miles south of Green River, July 3, 1951, *Preece & Turner 2883* (GH, RM, isotypes; WS, type).

The two varieties of *C. scaposa* are compared in Table 2. Data for this comparison were obtained from a study of approximately thirty different collections which represent nearly all of the available material of this rare genus as represented in the major herbaria.

TABLE 2. COMPARISON OF THE VARIETIES OF CHAMAECHAENACTIS SCAPOSA.

	C. scaposa scaposa	*C. scaposa parva*
1. Involcual bract length.	13.0 - 17.0 mm.	11.0 - 13.0 mm.
2. Corolla length.	6.5 - 9.0 mm.	5.5 - 7.2 mm.
3. Pappus length.	5.0 - 7.1 mm.	4.2 - 6.3 mm.
4. Leaf base.	Mostly truncate to cordate.	Mostly cuneate to truncate.
5. Leaf margin.	Entire to crenate.	Mostly entire.
6. Upper leaf surface.	Sparingly hirsute to nearly glabrous.	Sparingly to densely hirsute.
7. Petiole length.	1.2 - 4.0 cm.	1.0 - 1.8 cm.

The morphological variation between the two varieties is mainly quantitative. *Chamaechaenactis scaposa scaposa* is consistently larger as to total plant size and as to size of individual

parts (table 2). Also, the pubescence of the upper leaf surface is quantitative with *C. scaposa parva* being consistently more hirsute than *C. scaposa scaposa*. On the other hand, *C. scaposa scaposa* plants have many more leaves with crenate margins than do those of *C. scaposa parva* which have mostly entire leaves. Since there is a positive correlation between the geographic distribution (fig. 1) and many morphological features, there seems to be good justification for proposing varietal rank for these closely related entities.

The authors wish to express appreciation to Dr. Marion Ownbey for a critical reading of this paper and to John Rumley for the drawings.

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NEW AND UNUSUAL FLESHY FUNGI FROM WYOMING

ALEXANDER H. SMITH AND W. G. SOLHEIM

We plan, in this series of papers on the fleshy fungi of Wyoming, to present data on new and rare fungi as they are encountered in the course of collecting throughout the State. Wyoming is an interesting state from the standpoint of fleshy fungi because of the many mountain ranges separated by semi-arid areas of great extent. Collecting these fungi, however, is often somewhat of a problem because of the varied pattern of precipitation and temperature from year to year. There are still many undescribed and many poorly known species in the Rocky Mountain area, and of course our main objective is to discover and describe these as rapidly as possible. A second important objective is to acquire data for plotting the distribution of both the rare and common species. In this respect it is interesting to note here the extension to the most easterly range of the Rockies of the ranges of a number of species described from the West Coast. Mycologists are just beginning to get sufficient data on many species to allow meaningful distributions for them to be established. Collections from Wyoming will yield valuable information on this subject. The

third main objective is to establish associations, whenever possible, between a given species of fungus and a given species of seed plant. Naturally this phase ties in with a study of distribution because in many instances it is evident that the distribution of a particular fungus directly parallels that of a species or genus of seed plants. Since such associations are based on circumstantial evidence, many observations are needed to establish a correlation. If the fungus is a mycorrhiza-former, the association is likely to be closer than if the fungus is merely a saprobe living, say, on the fallen needles and debris of conifers.

The work of exploration was begun in the summer of 1950 and was continued by the resident author during the season of 1951. It will be continued whenever opportunity favors in the future. The present report contains a few of our interesting discoveries, and represents only a fraction of the material collected. In the difficult genera such as *Cortinarius, Russula* and *Psathyrella,* it often takes several years collecting to properly establish the presence of, and to circumscribe, the taxa as they occur in an area. In this type of work it is too easy to fall into the error made by many mycologists of collecting in an area only one season and then drawing extensive conclusions from the material obtained even though much of it may be scanty and atypical.

The specimens cited are deposited in the Herbarium of the University of Michigan, the Rocky Mountain Herbarium of the University of Wyoming and in the personal herbarium of the resident author. The color names within quotation marks are taken from Ridgway (1912). For species for which no technical description is given in the text of this paper, a citation of the description used to identify the collection is given following the authority of the species. The nomenclature followed is according to The International Rules of Botanical Nomenclature.

List of Species

Armillaria luteovirens (Fr.) Sacc. (Smith 1950, p. 354). This rare fungus was first found in North America in the Columbia River Gorge near Crown Point, on the Oregon side of the river. Subsequently, during the season of 1948 Stuntz and Smith made a number of collections in Mount Rainier National Park (*Smith 29648; 30309; 30459; 30511; 30993; 31426; 31538,* and one unnumbered) during July, August and September. During the season of 1950 it was observed on a number of occasions in the Happy Jack section of the Pole Mountain area, Laramie Mountains, Albany County, Wyoming (*Smith 35349; 35681*) during August, and the resident author collected it again in 1951 (*Solheim 3408; 3409*).

In the field this fungus is not always easily distinguished

from *A. albolanaripes* Atk., especially if faded fruiting bodies of both are encountered—as may easily happen in dry areas such as that around Pole Mountain. In the laboratory the amyloid spores of *A. luteovirens* enable it to be readily distinguished. In most of the Wyoming collections the bright yellow of the typical form of *A. luteovirens* had almost disappeared, being visible only in the incurved edges of the pilei. In one collection (*Smith 35681*) the caps were pallid with avellaneous scales and the stipe white and nearly smooth. Another collection, however (*Solheim 3409*), shows the characteristic color and scales on both pileus and stipe. One of the young fruiting bodies stained pale yellow when bruised, (*Smith 35349*) a reaction we have not observed on any of the other collections listed.

Calvatia fumosa Zeller (1947, p. 309). An excellent collection of this species was made at Little Brooklyn Lake, Medicine Bow Mountains, Albany County, Wyoming, on soil under spruce and fir, August 9, 1951, by Ragnhild and W. G. Solheim (*Solheim 3389*). This extends the known range to the eastern Rocky Mountains. It was described from specimens collected near Crater Lake in Oregon and Mount Shasta in California. The smokly brown to pallid peridia remind one of a *Scleroderma*.

Clitocybe maxima (Fr.) Kummer (Smith 1944, p. 675). Good material of this species was found by Ragnhild and W. G. Solheim on wet soil under aspen and conifers, Libby Creek Bridge, above Centennial, Medicine Bow Mountains, Albany County, Wyoming, August 9, 1951 (*Solheim 3381*). The spores in this collection measure 9-12 × 5-6.5 μ as contrasted to 7-9 × 5-6 μ in Smith's Olympic Mountain collection, and many two-spored basidia are present. Aside from these two characters, the Olympic and Wyoming collections appear to be identical. This species has now been found in Michigan also, so its known distribution in North America has been considerably extended.

Gautieria graveolens Vitt. f. **inodora** f. nov. *G. graveolens* f. *graveolens* similis sed inodora. Specimen typicum legit prope Tahquamenon Falls State Park, Luce County, Michigan, July 9, 1951, *Smith 36761*.

Spores 13.5-18 × 9-11 μ, pale yellowish in KOH, rusty brown in Melzer's reagent, 5-8 longitudinal striations, outer envelope wavy to nodulose along the backs of the striations (or the bumps appearing almost bubble-like), the interior thickened wall yellowish in KOH, smooth or nearly so, spore usually short-pedicellate from remains of the sterigma, outer spore membrane usually terminating as an inconspicuous collar around apex of apiculus (where the latter broadens into the spore); basidia two-spored, 28-35 × 10-14 μ; cystidia none seen; subhymenium pseudo-parenchymatous; trama of narrow gela-

tinous (in KOH) hyaline hyphae; no clamp connections seen; peridium 1-3 cm. diam., rubbery cartilaginous fresh, *inodorous;* columella branching and gelatinous in texture; cavities opening to exterior minute, round to irregular, remains of peridium scanty and evanescent, of loosely interwoven hyphae; gleba cinnamon at maturity.

Collected at base of a tree at the viewing area at the Upper Falls, Tahquamenon Falls State Park, Luce County, Michigan, July 9, 1951, by C. W. Creaser (*Smith 36761*). In Wyoming it has been found above Nash Fork Bridge, below University of Wyoming Science Camp, Medicine Bow Mountains, Albany County, August 9, 1951, *Solheim 3396.*

Old as well as young fruiting bodies were present in the Michigan collection and no odor whatsoever was present. The spores, in addition, average smaller than as given by Zeller and Dodge (1918) and have fewer striations. These and the apparent lack of cystidia may possibly be further distinguishing characters. Povah collected a very similar form, from Isle Royal, Michigan, which C. W. Dodge identified as *G. graveolens,* but it possessed an odor. Creaser's collection appears to be the same as the Isle Royal collection microscopically, and it is on this basis that his collection is described as a variant of *G. graveolens.* The Wyoming collection appears to be the same also but is made up of young to barely mature peridia. For this reason it is not designated as the type.

Kuehneromyces vernalis (Pk.) Singer and Smith (1946, p. 514). According to our experience this is the commonest brown-spored agaric on decaying conifer wood during the spring and early summer in the northern Great Lakes Region and the Western United States. It often fruits throughout the season in Wyoming because of the high elevations. We found it frequently in the vicinity of the University of Wyoming Science Camp during 1950 (*Smith 34370; 34377* and *34384* at Sheep Mountain; *34417; 34436; 34807* from the Haskins Creek Area in the Sierra Madre Mountains, July 13; *34888* at Pole Mountain), and the resident author collected it again on several occasions in 1951 (*Solheim 3370; 3373*). The length of the fruiting season in 1950 cannot be judged from our records because we tired of collecting the fungus after the middle of July.

Mycena Overholtsii sp. nov. Pileus 2-5 cm. latus, glaber, atrofuligineus demum pallide cinereus, subhygrophanus; lamellae confertae, subdistantes, latae, pallidae dein cinereae; stipes 4-10 cm. longus, 2-6 cm. crassus, deorsum dense strigosus et "Verona brown"; sporae 6-7 × 3.5-4 μ; cheilocystidia 26-32 × 5-8 μ, fusoid-ventricosa vel cylindrica. Specimen typicum legit *Solheim, Thiers and Smith* (*Smith 34405*), University of Wyoming Science Camp, Medicine Bow Mountains, Albany

County, Wyoming, June 29, 1950.

Pileus 2-5 cm. broad, obtuse to convex, expanding to plane or nearly so, margin in some recurved in age, surface glabrous and moist to slightly lubricous, dark blackish fuligineous at first, gradually becoming pale grey to pallid, margin often translucent-striate in age, subhygrophanous; flesh watery gray, cartilaginous, taste mild; odor pungent and yeasty; lamellae close to subdistant, moderately broad, broadly adnate or in age subdecurrent, whitish to pale cinereous, both flesh and gills often staining gray when bruised, edges even; stipe 4-10 cm. long, 2-6 mm. thick, enlarged downward, pallid above, darker below and becoming reddish brown downwards ("Verona brown"), densely fibrillose-strigose over the lower two-thirds.

Spores 6-7 $\times$ 3.5-4 μ, narrowly ovate to oblong, or pip-shaped when immature, smooth, distinctly blue in Melzer's solution; basidia four-spored; pleurocystidia rare to absent, similar to cheilocystidia; cheilocystidia filamentous to fusoid-ventricose, scattered, 26-32 $\times$ 5-8 μ, smooth; gill trama somewhat interwoven to subparallel, subhymenium gelatinous in KOH, of closely interwoven narrow hyphae; pileus trama with a thin to rudimentary pellicle of appressed narrow (2-4 μ) hyphae and only subgelatinous in KOH, hypodermal region becoming somewhat differentiated or remaining scarcely differentiated from remainder of the flesh, trama proper pale orange-brown in Melzer's solution (as is the gill trama also); clamp connections present.

Habit, habitat and distribution. Densely cespitose on rotting conifer logs and stumps at high elevations in the Rocky Mountains and the Cascades, in the spring and early summer as the snow melts. The large clusters of fruiting bodies are often found on wood still partly buried in the snow. Imshaug (*Smith 29002*) found it in Mount Rainier National Park, during July, under conditions similar to those of the type collection. Additional collections from the Medicine Bow Mountains are as follows: *Smith 34320; 34327; 34328; 34329; 34358; 34360; 34399; 34402; 34420; 34466; Solheim 2810; 2836* and *Thiers 100.*

The senior author first studied this species from material sent to him by the late L. O. Overholts but erroneously referred it to *M. laevigata.* The study of abundant collections of fresh specimens showed it to be an undescribed species which we take pleasure in dedicating to Professor Overholts. *M. Overholtsii* is most closely related to *M. laevigata,* but differs in the stipe not being either lubricous or viscid, in the manner in which the gills stain, and particularly in the gray or darker color of the gills as dried. The pungent odor may be an additional character since it was fairly constant during the time

we observed fresh material. When fresh the two species actually appear quite different. The time and manner of fruiting also appear to be distinctive. Apparently the fungus is not at all uncommon during the spring and early summer in the mountains of our western states.

Mycena subceracea sp. nov. Pileus 10-20 mm. latus, convexus, fuscus, glaber; lamellae decurrentes, subdistantes, angustae, pallidae, stipes 2-3 cm. longus, 2-3 mm. crassus, pallidus, glaber; sporae 7-9.5 × 4-4.5 μ. Specimen typicum legit *Smith 35184,* July 27, 1950, North Fork, Little Laramie River, Medicine Bow Mountains, Wyoming.

Pileus 10-20 mm. broad, convex with an incurved margin, expanding to plane or the margin uplifted slightly, surface fuscous, scarcely fading, pallid cinerous in old specimens or when dried; no odor or taste, consistency cartilaginous; lamellae decurrent, subdistant, narrow, pallid to grayish; stipe 2-3 cm. long, 2-3 mm. thick, equal or nearly so, pallid, naked above, base white-fibrillose to strigose.

Spores 7-9.5 × 4-4.5 μ, oblong in face view, in side view curved slightly near apiculate end (hence with a depression), smooth, thin-walled, bluish in Melzer's solution (amyloid); basidia four-spored, 26-30 × 7-8 μ; pleurocystidia scattered, subcylindric with flexuous walls and rounded apexes, 50-90 × 8-11 μ, walls thickened somewhat at least in mid-portion, hayaline in KOH, yellowish in Melzer's solution; cheilocystidia similar to pleurocystidia but usually smaller and with thin walls; gill trama subparallel, yellowish in Melzer's solution; subhymenium very thin and not distinctive; pileus trama with a rudimentary pellicle of diverticulate hyphae or diverticulate hyphae arising from the surface of the exposed hypodermal cells, hypoderm well differentiated, several cells deep, trama proper filamentous and interwoven, the hyphae 10-18 μ broad, yellowish in iodine; clamp connections absent.

Habit, habitat and distribution. Gregarious under *Pinus contorta* in seepage area near a beaver dam, at an elevation of 8800 feet.

The hairs over the base of the stipe are made up of thick-walled hyaline hyphae. The fungus resembles *Hygrophorous recurvatus* in aspect when fully expanded, but it is totally different microscopically. In the classification of Smith (1947) it would key out in the Omphaliariae where the amyloid spores would place it near *Mycena pseudogrisea* and *Mycena turbinata.* The long narrow pleurocystidia with slightly thickened walls separate it from either.

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ANNUAL PLANTS AT HIGH ALTITUDES IN THE SIERRA NEVADA, CALIFORNIA

F. W. Went

In a previous paper (Went, 1948) some remarks were made about annual plants in the southern Sierra Nevada. It was shown that 75 per cent of them had close relatives in the desert, because 1) the alpine habitat of the southern Sierra is climatologically closely related to the desert habitat, and 2) so many alpine annuals belong to western American endemic genera. From Table 3 in the cited paper it would seem as if therophytes (annual plants) were more developed in the European alpine regions than in the Sierra Nevada. Observations made in 1951 in the Evolution Basin of the Southern Sierra Nevada (just west of Bishop) and in 1952 in the Mt. Banner-Ritter area tend to modify the latter conclusion. At an elevation of exactly 3000 m., about 300 m. below timberline, a total of 36 annual plants was observed (see Table 1). At 3300 m., still 12 annuals were observed, which are marked in the table. There is no doubt in my mind that many more annual species can be found at 3000 m. or above in other localities of the Sierra Nevada, or in other years. It is difficult to use the altitudinal distribution data from Jepson, since they are rather consistently too low. This may be partly due to the fact that many of his figures are based on the northern and central California mountains rather than the southern Sierra Nevada. It also is caused by the necessarily incomplete collection on which his conclusions are based, but perhaps the most important factor is that when the seeds of annuals are present at higher altitudes, they germinate more rarely, and thus these plants are collected only occasionally.

Table 1 gives data which were obtained through perusal of the herbarium of the University of California in Berkeley, Jepson's Manual, and trips into the Sierra Nevada in 1945-1951. In 1945 and 1946 the northeastern part of Yosemite National

Table 1. Altitudinal distribution records (m. above sea level) of 49 obligate, facultative, or occasional annuals in the southern Sierra Nevada.

Annuals	Altitudinal range according to Jepson	Highest recorded in Herbarium U.C. Alt.	Year	Personal observation 1947 3000 m. or over	1947 3300 m. or over	1951 3000 m. or over	1951 2750 m. or over	1952 3000 m. or over
Androsace septentrionalis var. subumbellata	3500-3900	3800	'33, '37, '37					
Chenopodium album	not given						X	
Collinsia parviflora	760-2600			X	X	X	X	X
C. Torreyi	900-2450							
Collomia linearis	300-2500							X
Cryptantha glomeriflora	1800-3100	3300	'46, '50			X	X	X
Descurainia pinnata	400-2600						X	
Draba stenoloba	2100-3600			X		X		X
Eleocharis acicularis var. bella	not given	3300	'31			X		
E. Bolanderi	1800-2100							X
Epilobium angustifolium	600-2000				X	X		
E. minutum	30-1400					X		X
Eriogonum spergulinum	1500-2750						X	X
Galium bifolium	1500-2450							X
Gayophytum humile	1000-2450			X	X	X	X	X
G. ramosissimum	1500-3300							
Gilia leptalea	300-2750	2750	'35			X	X	
Gnaphalium palustre	3-1200	2300				X	X	
Hemizonella minima	1100-2450	2450				X	X	X
Juncus bufonius	not given					X		X
J. triformis	60-1900	(see Hermann)		X	X	X	X	X
Lewisia nevadensis	2100-3300				X	?	?	
Linanthus ciliatus	100-2450	3050	'35			X	X	
L. ciliatus var. neglectus	1800-2750				X	X	X	X
L. Harknessii	1500-2100	3100	'37			X	X	X
L. montanus	400-1500	2750	'05					
L. oblanceolatus	2600-3000	3300	'49					
Mimulus Breweri	1450-3000	3300	'37, '40			?		
M. coccineus		3300	'37					
M. deflexus		3300	'42					
M. densus		2750	'37, '49					
M. leptaleus	2100-2450	3200	'43					
M. mephiticus	1500-3300	3300	'96					
M. montioides	1800-3300	2750	'42					X
M. nanus	1500-3300	3300	'42			?		?
M. rubellus	1800-2900	3300	'42					
M. Suksdorfii		3500	'50	X	X	X	X	X
M. Whitneyii		3300	'37					
Muhlenbergia filiformis	not given							
Navarretia Breweri	1200-2400			X	X	X	X	X
N. divaricata	750-1500	2100						X
Nemophila spatulata	1500-2750	3200	'38				X	X
Orthocarpus lacerus						X	X	X
Phacelia Eisenii	1250-2450	3300	'49					X
P. humilis	1200-2500	2850	'44			X	X	X
P. ramosissima	60-2750	2900	'46					
Plagiobothrys Torreyi	1200-2450	2450						
Polygonum Douglasii	1200-2450	3300	'42			X		
P. imbricatum (Kelloggii)	1800-3000	2900	'36		X	X	X	X
P. minimum	1200-2100	3500	'37	X	X	X	X	X
P. sawatchense	not given	2700	'05		X	X	X	X
P. spergulariaeforme	not given							
Saxifraga bryophora	2450-3400							X
Streptanthus tortuosus	600-3200				X	X	X	X
				X		X	X	X

Park was visited, and at high altitudes (3000 m. or over) no annual plants were observed. In 1947 a limited number of annuals was found near the "Timberline" station of the Carnegie Institution of Washington, in the vicinity of Tioga Pass in Yosemite National Park, at 3000 m. altitude. In 1949 the Kearsarge Pass area, in the eastern part of Kings' Canyon National Park, was visited, and at 3000 m. only *Polygonum imbricatum* was found. Then in 1951 and 1952 an unprecedented development of annuals was found in the Evolution Basin and Agnew Pass areas, in the northernmost end of Kings' River National Park and just south of Yosemite National Park. Most of the observations were made near Colby Meadows, 3000 m., Evolution Meadow, 2750 m., Evolution Lake, 3300 m., and Agnew Pass, 3000 m.

Eighteen species of annuals were observed at a greater altitude than they had been collected previously. Ten were observed at the same altitude as the highest collected previously, and only six were found lower than they have been found before. Therefore it seemed as if 1951 and 1952 were very special years for the growth of annual plants at high altitudes in the southern Sierra Nevada. To get some data concerning prevalence of annuals at certain altitudes in different years, the collections of 28 species, reaching above 2400 m., were counted in the herbarium of the University of California in Berkeley, and they were divided into four altitudinal ranges and recorded according to year of collection. Table 2 shows the data as obtained from the perusal of the herbarium. It was immediately clear that in two years, 1937 and 1942, about half the annuals were collected at or above 3300 m., whereas in all other years only a small percentage, usually under 20 per cent, was collected at those altitudes. This was partly due to intensive collecting at the higher altitudes during those years (Sharsmith in 1937), but when we compare the number of annuals collected at lower altitudes below 3000 m.), we find that about the same numbers were collected per year in 1937 and 1942, as in all other years from 1933 on. Therefore the general collecting in those years was about normal. In 1949 and 1950 collecting of annuals was about evenly spread over the different altitudinal ranges, which was not an indication of relative abundance at higher altitudes; at least my personal recollection of the aspects of the vegetation in the Kearsarge area during 1949 does not indicate any unusual occurrence of annuals at or above 3000 m. Whereas in the 1948 paper is could be concluded from Table 3 that the number of annuals at comparable altitudes (in relation to timberline) is greater in the Alps than in the Sierra Nevada, a closer analysis seems to show just the opposite situation; there are more annuals just below timberline in the southern Sierra Nevada than in the Alps. And the list of Table 1 is far from complete, since it is based on only very limited field

Table 2. Altitudinal distribution of the collections of 28 annual species in the Herbarium of the University of California at Berkeley, separated according to years.

Years	Altitudinal Range							
	3300 m.		3000 m.		2700 m.		2400 m.	
	Total annuals per year	Per Cent	Total	Per Cent	Total	Per Cent	Total	Per Cent
1937 and 1942	6.0	48	4.5	36	1.5	12	0.5	4
1949 and 1950	2.0	29	1.5	21	1.5	21	2.0	29
1933 - 1936; 1938 - 1941; 1943 - 1946.	0.3	10	0.7	30	0.7	30	0.7	30

observations and a very incomplete survey of collections made by others. It seems likely that a complete list of annuals occurring at or above 3000 m. in the Sierra Nevada will comprise 60 to 80 species.

There is an interesting fact which can be extracted from Table 1, and that is the enormous altitudinal range of some of these annuals (Table 3). Whereas perennials, trees, and shrubs usually have a rather limited altitudinal range within which they occur, in annuals this range is much wider, because at different altitudes the same sequence of temperatures may occur at different times of the year. Thus the annuals listed may flower in May or June at their lower range, and in July or August at the higher range, and in this way flowering occurs at the same temperature.

Even though plants at different altitudes may be subjected to the same temperatures at some critical stage of their development, at other stages they are necessarily growing under very different conditions, such as different photoperiods. Therefore we can expect to find strong ecotype formation among these annuals, especially among those with the greatest altitudinal distribution range. Those in Table 3 with a range over 3100 m. are: *Eleocharis acicularis* and *Juncus triformis*. Both of these have been separated into a number of varieties, which, in *Juncus triformis*, have been elevated to the rank of species (Hermann, 1950). An altitudinal distribution range between 2700 and 3100 m. is found in: *Collinsia parviflora*, *Epilobium angustifolium*, *E. minutum*, *Gilia leptalea*, *Gnaphalium palustre*, *Juncus bufonius*, *Linanthus ciliatus* and *Phacelia ramosissima*. Among these ten species only *Epilobium* and *Gnaphalium* can be distributed easily over long distances by wind; the distribution of the other species is probably largely by water, and over limited distances only. Therefore we can expect rather extensive differentiation of ecotypes, almost completely separated geographically, in *Collinsia*, *Gilia*, *Juncus*, *Linanthus* and *Phacelia*, and these plants should be excellent material for the study of evolution. Being annuals, a genetical

Table 3. Number of species which have an altitudinal range within the limits shown in the upper row, as taken from Table 1.

Meters	0 - 300	300 - 700	700 - 1100	1100 - 1500	1500 - 1900	1900 - 2300	2300 - 2700	2700 - 3100	3100 - 3500
No. of species	0	1	3	4	15	5	3	8	2

analysis of these plants might be feasible, and thus supplement the data collected by Clausen, Keck, and Hiesey on perennials.

For such an evolutionary study it is necessary to make an extensive seed collection of these annuals in different localities, and every botanist is urged to collect seed of any species listed in Table 1 and to send them to the author.

To see whether the climatical conditions in the years 1937, 1942, and 1951 showed parallel deviations from normal, the weather data from five High Sierra meteorological stations were averaged. The monthly average temperature, and total rainfall were plotted and compared with the normal averages. As stations were chosen; Truckee or Soda Springs (2000 m alt.), Twin Lakes or Tamarack (2400 m. alt.), Ellery Lake (2900 m. alt.), Huntington Lake (2150 m. alt.), and Giant Forest (2000 m. alt.). They lay equidistant approximately in a line north-northwest to south-southeast at 100 km. intervals. This gave a good coverage of climatic conditions in the central and southern High Sierras. The data showed no common denominator for the years with high rates of germaination at high altitudes. It is possible that a warmer than average month of May has something to do with it, but there seem to be no correlations with wet or very warm or cold preceding winters. It is evident that only a much more detailed study of the germination conditions near each of the high altitude meteorological stations might produce useful correlations.

The seeds collected in the Evolution Basin and an additional collection from Timberline Station made by Dr. Jens Clausen were laid out to germinate in different temperatures. The seeds which germinated were those treated for several months at 0° or 5° C., and then kept at low temperatures of 10°-6° C. Most readily grew the bulbils of *Saxifraga bryophora;* in some cases more than 50 per cent developed. In a 16-hour photoperiod at 10° C., alternating with a 6° C. nyctotemperature, the rosettes grew large, and inflorescences with a terminal perfect flower and many lateral bulbils developed. Under the same temperature treatment *Collinsia parviflora, Mimulus* species, *Linanthus Harknessii, L. ciliatus neglectus,* and *Juncus bufonius* germinated and grew well; the plants became several times larger than those observed in nature. Of *Nemophila spathulata* and *Gayophytum* each only one seed (per 50) germinated, but both died before anthesis.

SUMMARY

Based on field collections and a herbarium study, it was shown that at least 40, and probably between 60 and 80 species of annuals could be found at altitudes of 3000 m. and over in the southern Sierra Nevada of California. In a few years (1937, 1942, 1951, 1952) there were an exceptional number of annuals at higher altitudes; this could not be correlated with any meteorological peculiarities in those years.

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NOTES ON MALVACEAE IV. THREE NEW SPECIES AND A NEW COMBINATION

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Abutilon Carterae sp. nov. Planta herbacea, ut videtur annua; caulibus usque 0.5 m. altis, validis, densissime albido-lanatis; foliorum laminis usque 20 cm. longis, suborbicularibus, profunde cordatis sinu aperto, subito acuminatis, crenulato-denticulatis, 9-nervatis, valde discoloratis, subtus dense albido-tomentosis; petiolis validis, laminam plerumque subaequantibus; stipulis filiformibus, mox caducis; floribus in paniculam terminalem, elongatam, pauciramosam, apertam dispositis; calycibus fructiferis circa 6 mm. longis, circa dimidiam partem fructus aequantibus, tomentosis, lobis deltoideis, acuminatis; petalis circa 8 mm. longis, patentibus, ochroleucis, obovatis, insigniter venosis, androeceum et stylos multo superantibus; staminibus numerosis, tubo brevi confertis; stylis elongatis; stigmatibus parvis, capitatis; fructibus breviter cylindraceis, truncatis; carpellis 8 vel 9, circa 10 mm. longis, breviter aristatis, villosis, loculicidalibus, plerumque 2- spermis; seminibus deltoideo-reniformibus, circa 2.5 mm. longis, minute lineato-stellulatis.

Plant herbaceous, apparently annual; stems tall (0.5 m. or more), stout (5 mm. in diameter near base), densely white-lanate with very short, partly forked hairs; leaf blades up to 20 cm. long and 17 cm. wide, suborbicular, deeply cordate with an open sinus, abruptly acuminate, crenulate-denticulate, sometimes obscurely trilobate, strongly discolorous, dark green and tomentulose with very short, simple and forked hairs above, densely white-tomentose beneath, 9-nerved from the base, the veins somewhat prominent beneath; petioles

stout, often nearly as long as the blades; stipules filiform, soon caducous; inflorescence an elongate, few-branched, open, terminal panicle; fruiting calyx open-campanulate, about 6 mm. high, about half as long as the fruit, rather loosely tomentose, the lobes deltoid, acuminate; petals about 8 mm. long, spreading, light cream in color (collectors' note), obovate, conspicuously veined, much longer than the androecium and styles; stamens many, crowded on the short tube; style branches elongate; stigmas small, capitate; fruit short-cylindric, truncate; carpels 8 or 9, about 10 mm. long, shortly aristate (the awns about 1 mm. long), villous with long, mostly simple hairs, finally dehiscent loculicidally nearly to the base; seeds usually 2 per carpel, deltoid-subreniform, 2.5 mm. long and wide, stellulate-puberulent in irregular lines.

Type. Arroyo de Tabor, Sierra de la Giganta west of Puerto Escondido, Baja California, Mexico, elevation 125 m., growing with *Lysiloma, Ulmus,* and *Erythea, Carter & Kellogg 2871* in 1950 (University of California Herbarium no. 963749; isotype in Herbarium California Academy of Sciences no. 371705). Collected also three years previously in Arroyo Hondo, north side of Cerro de la Giganta, "among loose rocks on canyon side," elevation about 630 m. (*Carter, Alexander & Kellogg 2055*). The species is known only by these two collections in eastern Baja California between latitudes 26°10′ and 25°48′N. All of the specimens have only very mature fruits and a few withered flowers.

Abutilon Carterae evidently is related to *A. sonorae* Gray of mainland Mexico and southern Arizona, but differs strikingly in the conspicuously lanate stems devoid of the very long and slender, spreading, simple hairs that are borne on the otherwise merely puberulent to nearly glabrous stems of *A. sonorae.* Also the leaves are more discolorous in *A. Carterae.* They are usually markedly although shallowly trilobate in *A. sonorae,* but there is only an occasional very slight indication of this character in *A. Carterae.*

Abutilon coahuilae sp. nov. Planta ut videtur herbacea vel suffrutescens; caulibus erectis, supra ramosis, infra teretibus, apicem versus paulo angulatis; caulibus, foliis, et calycibus densissime pannoso-canescentibus pilis minutis stellatis; foliorum laminis ovatis, breviter cordatis sinu aperto, gradatim et acute acuminatis, insigniter duplo serrato-dentatis, crassiusculise, base 9-nervatis, reticulatis, nervis subsus elevatis, petiolis laminas subaequantibus; stipulis subulatis, mox caducis; floribus in paniculam terminalem, elongatam, apertam, foliosam, longe-ramosam dispositis; calycibus fructiferis profunde partitis, valde reflexis, fructu cylindraceo brevioribus, lobis ovato-lanceolatis, acuminatis; petalis ut videtur flavis vel aurantiacis, circa 9 mm. longis, obovatis, insigniter venosis,

androecio stylisque longioribus; carpellis 5, triovulatis, maturis circa 10 mm. longis, breviter aristatis, stellato-canescentibus, loculicidalibus atque demum septicidalibus; seminibus circa 2 mm. longis, obovoideo subreniformibus, pubescentibus.

Plant apparently herbaceous or suffrutescent; stems erect, branching above, terete below, somewhat angulate toward apex; stems, leaves and calyx very densely pannose-canescent with minute stellate hairs, the pubescence yellowish in the dried specimen; leaf blades ovate, shallowly cordate with an open sinus, gradually and sharply acuminate, conspicuously doubly serrate-dentate, thickish, 9-nerved from the base and reticulate, the nerves prominent beneath; petioles nearly as long as the blades; stipules subulate, soon caducous; inflorescence a terminal, elongate, open, leafy, long-branched panicle; fruiting calyx deeply cleft, strongly reflexed, shorter than the cylindric fruit, the lobes ovate-lanceolate, acuminate; petals apparently yellow or orange, about 9 mm. long, obovate, conspicuously veined, longer than the androecium and styles; carpels 5, triovulate, at maturity about 10 mm. long, shortly aristate (awns 1—1.5 mm. long), stellate-canescent, loculicidally and finally septicidally dehiscent; seeds about 2 mm. long, obovoid-subreniform, pubescent.

Type. Cerro de Santiago near Bolívar, Coahuila, Mexico, *C. A. Purpus 4617* in 1910 (University of California Herbarium no. 144778; isotype, U.S. National Herbarium. The type specimen has excellent fruit but only one withered flower, and does not show the basal part of the plant.

Abutilon coahuilae is nearly related to *A. malacum* Wats., less closely to *A. incanum* (Link) Sweet. From both of these species it differs in its more sharply toothed leaves and, especially, in its distinctly aristate (not merely mucronulate) carpels. In the very fine and close pubescence it resembles *A. malacum,* but the latter has broader, mostly suborbicular leaves and a generally more compact inflorescence.

Pavonia Ulbrichiana sp. nov. (Section *Eupavonia*). Frutex 1-3 m. altus; ramis juvenilibus, foliis, pedunculis, involucellis et calycibus hirsuto-tomentosis pilis longiusculis; foliorum laminis crassiusculis, paulo discoloribus, late ovatis, acutiusculis, subcordatis, irregulariter duplo dentatis, e base 5-nervatis, nervis subtus elevatis; petiolis validis, quam lamina multo brevioribus; stipulis subulatis, brevibus, hirsutis, mox caducis; floribus in axillis foliorum superiorum solitariis; pedunculis paulo brevibus, validis, apicem versus articulatis; involucelli phyllis 4, distinctis, latissime deltoideo-ovatis, circa 16 mm. longis et latis, cordatis, acutiusculis; calycibus 15-20 mm. longis, campanulatis, profunde partitis, lobis oblongo-ovatis, acutis, plurinervatis; petalis rubris, erectis, externe sparse pubescentibus, circa 4.5 cm. longis, androeceo et stylis paulo longioribus; carpellis circa 8 mm. longis, leviter arcuatis, ob-

longis, obtusis, muticis, laevibus, ut videtur omnino dehiscentibus.

Shrub 1-3 m. high (collector's note); young branches leaves, peduncles, involucels, and calyces hirsute-tomentose with rather long, few-armed hairs, the pubescence (in the dried specimen) ferruginous; leaf blades (only the uppermost seen) rather thick, moderately discolorous, up to 6.5 × 5 cm., broadly ovate, subcordate, acutish, irregularly doubly dentate, 5-nerved from the base, the nerves prominent beneath; petioles stout, much shorter than the blades; stipules subulate, short, hirsute, soon caducous; flowers solitary in the axils of the upper leaves; peduncles rather short, stout, articulated near apex; involucel of 4 distinct, very broadly deltoid-ovate, cordate, acutish bractlets, these about 16 mm. long and wide; calyx 15-20 mm. long, campanulate, deeply 5-cleft, the lobes oblong-ovate, acute, several-nerved; corolla red (collector's note), about 4.5 cm. long, funnelform-campanulate, the petals erect, sparsely pubescent externally with hairs like those of the herbage, the petals somewhat longer than the androecium and styles; carpels 8 mm. long, about one-third as wide, oblong, slightly arcuate, obtuse, muticous, smooth, not evidently veined, apparently completely dehiscent.

Type. Maranhâo-Pará, Brazil, *Snethlage 170* in 1923 (Chicago Natural History Museum no. 693728), the only collection known to the writer.

As a rule, description of a novelty from such scanty material should be avoided, but *Pavonia Ulbrichiana* seems a very distinct species, although evidently related to the Brazilian *P. Garckeana* Gűerke. These two species, so far as the writer knows, differ from all other American representatives of the genus in having an involucel of only four bractlets, these broad and cordate. In *P. Garckeana,* however, the leaves are much longer than wide, the hairs of all parts of the plant shorter, the involucel, calyx, and corolla smaller, the calyx lobes narrower (deltoid-lanceolate), and the carpels very different, being only about one-half as long as in *P. Ulbrichiana*, obovoid-trigonous, reticulate-veined and nodulose-tuberculate.

The new species was given a name by the late Prof. Dr. Eberhard Ulbrich of the Berlin-Dahlem Museum, but was not published by him. It is a pleasure to dedicate it to him, in recognition of his outstanding contributions to our knowledge of the Malvaceae.

Sida pulverulenta (Ulbrich) comb. nov. *Abutilon pulverulentum* Ulbr., Engler's Bot. Jahrb. Beibl. 117:51. 1916.

This species is here transferred to *Sida* because Ulbrich described the carpels as "monosperma." A photograph of the type in the herbarium of the Chicago Natural History Museum bears a sketch, presumbably made by Ulbrich, showing a solitary, pendulous ovule. The relationship appears to be

with a more or less artificial group of species of Brazil, Paraguay, and northern Argentina, that includes *Sida adscendens* St. Hil., *S. purpurascens* Salzm., and *S. Regnellii* R.E. Fries. All of these, including *S. pulverulenta,* have the petals from white fading pink to rose-violet and fruits of 7 or more muticous carpels. *Sida pulverulenta* has the largest flowers of the group (petals about 20 mm. long), whereas they are less than 15 mm. long in the other 3 species. *Sida pulverulenta* differs from *S. Regnellii* in the absence of long, simple hairs on the stems and in its broader leaves. From *S. adscendens* and *S. purpurascens* it is distinguished by the more numerous carpels and other characters. The type of *Abutilon pulverulentum* came from near San Miguel, Dep. Cajamarca, Prov. Hualgayoc, Peru (*Weberbauer 3904*).

Identity of Hibiscus Pulverulentus Griseb. This plant was described by Grisebach (1879, p. 49) as an *Hibiscus,* although he compared it with *Fugosia phlomidifolia* St. Hil., which is *Cienfuegosia affinis* (H.B.K.) Hochr. Hochreutiner (1902, p. 45) although he had not seen a specimen, concluded that it might well belong to *Hibiscus,* although, in his monograph of that genus (1900, p. 173) he had referred it previously to *"Fugosia pulverulenta."* In her revision of the Argentinian species of *Hibiscus,* Rodrigo (1948, p. 150) accepted Hochreutiner's earlier opinion that this plant is a *Cienfuegosia* although she, too, had seen no specimen. The identity of Grisebach's plant seems now to be established by the discovery, in the University of California Herbarium, of a specimen labelled, in what is probably the handwriting of one of the collectors, "1082 *Hibiscus pulverulentus* Gr. n. sp. Salta Ende Nov. 73 Lorentz et Hieronymus." Although Grisebach (ibid.) cited no collectors' number, this specimen may well be an isotype. The plant is evidently a *Cienfuegosia,* and is *C. sulphurea* (St. Hil.) Garcke, according to Rodrigo's key to the Argentinian species (1941, p. 217) and J. B. Hutchinson's key to the genus (1947, p. 126) as a whole.

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TWO NEW OAK HYBRIDS FROM CALIFORNIA

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Quercus × subconvexa hybr. nov. (*Q. durata* Jepson × *Q. Garryana* Dougl.) Arbor parva vel arbuscula usque ad 6 m. alta ramulis griseo-brunneis tomentosis demum glabratis vero brunneisque alabastris ovoideis vel sphaeroideo-ovoideis hirsutis vel glabratis pallide brunneis 2.5—5 (8) mm. longis foliis denique deciduis in ambitu plerumque obovatis vel latioribus vel ellipticis 4—8.5 cm. longis 2—6 cm. latis paginis superioribus leviter convexis basi cuneatis vel rotundatis haud profunde lobatis vel crasse dentatis dentibus lobisve plerumque mucronatis paginis superioribus aliquanto nitidis eis inferioribus pallidis haud nitidis stellato-pubescentibus petiolis 4—8 mm. longis cupulis hemisphaeroideis 11—16 (-20) mm. latis 6—8 (-11) mm. altis glandibus ellipsoideis 20—22 (-30) mm. longis ca. 12 (usque ad 18) mm. latis.

Small tree to 6 meters in height. Twigs of the current year's growth 1—3 mm. in diameter, from grayish-brown and tomentose when young to glabrate and brown in age, with small, inconspicuous, light-colored lenticels. Buds 2.5-5 (or 8) mm. long, ovoid to round ovoid, hirsute to glabrate, light brown in color. Stipules caducous, 6-7 mm. long, ligulate to spatulate, appressed-pubescent on dorsal surface, light golden-brown. Leaves tardily deciduous, upper surface slightly convex, usually obovate to broadly obovate or elliptical in outline, 4-8.5 cm. long, 2-6 cm. broad, base cuneate or rounded, shallowly lobed or coarsely toothed, the lobes or teeth often abruptly acute with mucronate apices, upper surface somewhat shiny, from stellate pubescent in young leaves to glabrate in age except for sparse, short pubescence along the base of the midrib, lower surface pale and dull, stellate-pubescent; secondary veins 6-8 on a side; petiole 4-8 mm. long, pubescent or glabrate. Staminate catkins to 5 cm. long, rachis puberulent, perianth glabrous except for the ciliate margins of the lobes, stamens glabrous, well-exserted. Acorn cups hemispheric, 11-16 (or 20) mm. broad, 6-8 (or 11) mm. high, base of the scales distinctly tuberculate and covered with fine, light-colored pubescence, the tip flat, broadly triangular to ligulate, pubescent to glabrate and light brown in color, or the tuberculate portion sometimes tapering, keel-like, into the tip; acorn ellipsoid, about 20-22 (or 30) mm. long, about 12 (to 18) mm. broad, glabrate.

Type. Approximately 5 miles north-northeast of Gilroy (Morgan Hill Quadrangle: Section 16, Township 10 S., Range 4 E.); north slope, elev. 1300 feet, Santa Clara County, California, August 27, 1947, *Tucker 1581* (University of California Herbarium No. 938395).

Other collections examined. Type locality: Dec. 15, 1937,

Hendrix 728; May 1, 1946, *Tucker 1393A, B, C, D;* Oct. 5, 1946, *Tucker 1452;* Aug. 27, 1947, *Tucker 1582, 1583, 1584, 1585;* Oct. 7, 1951, *Tucker 2300A, B.* Marin County, California: Three-eighths mile west of Bluff Point, Tiburon Peninsula, Aug. 1, 1947, *Tucker 1576, 1577, 1578;* open serpentine hillside, ca. three-eighths mile east of Tiburon, Aug. 1, 1947, *Tucker 1580A, B, C, D, E, F, G.* Beside Ridgecrest Road, about 7.5 miles southwest of Fairfax, Aug. 31, 1947, *Tucker 1589;* Oct. 7, 1951 *Tucker 2302.*

The fact that oak species belonging to the same subgenus often hybridize when growing in close proximity to one another is well known. No authentic case is known thus far, however, of hybridization between a black oak (subgenus *Erythrobalanus*) and a white oak (subgenus *Lepidobalanus*) under natural conditions, although Pjatnitzky (1946) has reported the experimental production of such hybrids: *Q. borealis* var. *maxima* (of *Erythrobalanus*) × *Q. Robur* (of *Lepidobalanus*), and *Q. borealis* var. *maxima* × *Q. macranthera.* In a recent enumeration of interspecific hybrid oaks of North America, Palmer (1948) recognized 80 (a few of them doubtfully), and mentioned that more than 15 others (as yet unnamed) are indicated by specimens in the Arnold Arboretum herbarium and other collections. Eventually the total is certain to be much larger, particularly as the oaks of Mexico and Central America become more thoroughly known. The two hybrids described in this paper are noteworthy because of the remoteness of relationship of the parental species.

The parents of *Quercus* × *subconvexa* are strikingly different morphologically. *Quercus Garryana* is arborescent (in the part of its range where the hybrid occurs), deciduous, with moderately large, flat, lobed leaves (fig. 1), and occurs most commonly in mesophytic situations in the coast ranges of central and northern California, ranging northward as far as southern British Columbia. *Quercus durata,* on the other hand, is shrubby and evergreen, with small, hard, strongly revolute, toothed leaves. It comprises an element of the chaparral on dry slopes in the coast ranges of California, from Trinity County to Los Angeles County and in the Sierra Nevada foothills of Nevada, Placer and El Dorado counties. It usually occurs on serpentine formations.

This unusual hybrid first attracted the writer's attention when a specimen, *Hendrix 728,* was discovered in a folder of *Q. Garryana* material in the Vegetative Type Map Herbarium in Berkeley. Although it had been identified as *Q. Garryana,* and definitely resembled that species, it seemed obvious, nevertheless, that it was not conspecific.

The possibility of its being a hybrid between *Q. Garryana* and some other white oak was considered. The size of the leaves—in general, smaller than those of *Q. Garryana*—their more shallow lobing, their slightly convex (rather than flat)

Fig. 1. Representative leaves of *Quercus* × *subconvexa*, *Q.* × *Howellii*, and parental species: A. *Q. durata*, B. *Q.* × *subconvexa* (*Tucker 1581*), C. *Q. Garryana* (————————————), D. *Q.* × *Howelli*, (*Tucker 1591*), E. *Q. dumosa*.

upper surface, and the fact that they were persisting well into the winter (the collection was made Dec. 15, 1937), suggested an evergreen species with small, non-lobed, strongly convex leaves as the other parent. This combination of characters allowed only one possibility—*Q. durata.* The presence of this species in the same area was confirmed when a sheet was found in the Vegetation Type Map Herbarium with precisely the same collection data as that of the putative hybrid—identical location, date, and collector!

A visit to the collection site revealed the presence of fifty-two small trees, the tallest about fifteen feet in height, forming a small, compact, pure stand only about fifteen yards across. A striking homogeneity in habit and general appearance was immediately apparent throughout the group. It seems probable that the group represents a smaller number of clones. Arising from the soil close in around the bases of many of the trunks, were numerous shoots one foot or less in height. The subterranean portions of several of these shoots were seen to be attached to the main axis (root?) of one tree, about six inches below the soil surface. Some of the fifty-two larger trunks may well have originated in this way from a smaller number of older individuals. Muller (1951) has recently discussed the significance of vegetative reproduction similar to this in various oak species. Indeed, the variety *Breweri* of *Quercus Garryana* typically exhibits this mode of growth.

This stand was near the top of a hill, on a north-facing slope. Immediately below it was a patch of *Q. durata*—low compact shrubs. On this north slope was a mixed growth dominated by *Q. agrifolia* and *Umbellularia californica,* with a scattering of small trees of *Q. lobata. Quercus Douglasii* was present on the lower slopes, and a single thirty-foot tree of *Q. Garryana* was found near the foot of the hill, about 250 feet below the location of the putative hybrids.

The evidence seems to justify an assumption of a hybrid origin for these oaks. In addition to the presence of *Q. durata,* and the absence of other shrubby white oaks in their vicinity, they show similarities to *Q. durata* in a number of characteristics: (1) the leaves are slightly convex on the upper side, those of *Q. durata* usually being strongly so, (2) the teeth and lobes of the leaves have mucronate apices, (3) the stellate hairs of upper and lower leaf surfaces respectively are similar in length and relative abundance, (4) minute wart-like protuberances bearing stellate hairs on the upper leaf surfaces, are characteristic of the *Q. durata* at the locality of the hybrids; leaves of the hybrid have similar, but fewer protuberances, (5) the size and shape of the acorns and cups are very similar, and to a lesser degree the cup scales, also, and (6) although this putative hybrid is not shrubby, its small stature could

logically be considered a state intermediate between a larger tree and a shrub, the latter being the habit exhibited by *Q. durata.*

Similarly, morphological evidence strongly indicates *Q. Garryana* as the other parent, although *Q. lobata* and *Q. Douglasii* (all three, of course, being arborescent, deciduous, white oaks) occur in the vicinity, also. *Quercus Douglasii* is eliminated for the following reasons: (1) all herbarium material of this species from Santa Clara County examined, had leaves which, on the average, were smaller and less deeply lobed than those of the hybrid, and (2) the hybrid shows no bluish leaf color (a common feature of *Q. Douglasii*) in either young or mature leaves. Of the other two species, the hybrid is more similar to *Q. Garryana* in all the characters analyzed:

Leaves. The usually broadly obovate leaf outline in the hybrid, broad, short lobes, and rather shiny upper surfaces all bear a closer resemblance to *Q. Garryana* than to *Q. lobata.*

In the hybrid, the reticulum of veinlets on the upper surface is fine, but conspicuous on close inspection. In this it is similar to *Q. Garryana;* in *Q. lobata* the reticulum is usually quite faint.

Stellate hairs. In length and abundance of stellate hairs on the lower leaf surface, the hybrid resembles *Q. Garryana* much more closely. In *Q. lobata,* these hairs are usually very short and abundant, forming a dense, felt-like covering. In *Q. Garryana,* they are usually distinctly longer, sparser, and almost never form a dense, felt-like indument. In the hybrid these hairs are even longer (varying toward *Q. durata* in this respect) and more sparsely distributed than in *Q. Garryana.*

Buds. In shape and pubescence of winter buds, the hybrid is closer to *Q. Garryana* than *Q. lobata.* Buds of the former are ovoid to narrow-ovoid, and densely hirsute; those of the latter are round-ovoid and pubescent with fine, mostly closely appressed hairs. Buds of the hybrid are mostly ovoid, from short-hirsute to glabrate.

Flowers. The stigmas of the pistillate flowers of the hybrid are spreading and recurved, in this respect similar to *Q. Garryana.* In *Q. lobata,* on the other hand, the stigmas are usually shorter and spreading but not recurved, or only slightly reflexed at the tips.

Fruit. The fruit of the hybrid shows no suggestion whatever of the large, elongated nut, or deep cup-shaped, strongly tuberculate cup that typify *Q. lobata.* It is, rather, very similar superficially to that of *Q. durata,* although in characters of the cup (notably color and shape of the cup scales) it is intermediate between the *Q. Garryana* and *Q. durata* of the locality.

The hybrid is intermediate between the two parental species not only in morphological characters, but also in the time of flowering and length of leaf persistence.

When first observed by the author, on May 1, 1946, a few of the hybrids were still shedding pollen, but for the most part the staminate catkins were withered and dry. On the shrubs of *Q. durata* at this location new growth was just coming out, and no staminate flowers had started to shed pollen as yet. Although the flowering time of *Q. Garryana* in this locality is not known from direct observation, specimens in the University of California Herbarium show it to be, for California in general, from late March through April (except for var. *Breweri* of higher elevations, which flowers later). Thus, if the latter part of April and the first part of May is the usual flowering period of the hybrids, they are apparently intermediate between the parental species. The occasional occurrence of unusual weather conditions of brief duration tending to retard the flowering of *Q. Garryana* or hasten *Q. durata,* could result in an occasional brief overlap in their flowering periods, thus providing the opportunity for hybridization.

Quercus durata, as mentioned previously, is evergreen, and *Q. Garryana* is deciduous. The hybrid is tardily deciduous, hence intermediate, as indicated by the following observations: *Hendrix 728,* collected December 15, 1937, exhibits numerous green leaves still persisting; on March 30, 1947, the trees of the stand were leafless except for a few persistent dead leaves; and on May 1, 1946, all leaves of the previous season had been shed, all foliage on the trees being new growth.

In March 1947, material was obtained from several members of this stand (*Tucker 1493-1499*), for study of meiosis in pollen mother cells. The haploid chromosome number was found to be twelve. This count agrees with those published by Duffield (1940), Hφeg (1929), Jaretzky (1930) and Sax (1930) for other hybrids and species of this genus. No meiotic irregularities were noticed, although a very few tetrads were observed with supernumerary nuclei. These represented 4 per cent or less of the total number of tetrads studied critically. Moreover, an analysis of pollen from specimens taken May 1, 1946, revealed a low percentage (about 3-7 per cent) of abnormal pollen. These observations are similar to those of Sax, who found no more than 8 per cent abnormal pollen in any of the hybrids she investigated, a percentage lying in the same general range (10 per cent or less) exhibited by all but one of the pure species she investigated.

Subsequent to the author's first collections in Santa Clara County, several occurrences of this hybrid in Marin County were brought to his attention by Mr. John Thomas Howell, of the California Academy of Sciences. Howell has since cited them in his "Marin Flora" (1949). The sub-prostrate shrubs on the hillside overlooking the community of Tiburon (*Tucker 1580-A, B, C, D, E, F, G*),cited by Howell, were previously re-

ferred to *Q. Garryana,* by Miss Alice Eastwood (1946). They differ from typical *Q. Garryana,* however, in the following characters, which vary in the direction of *Q. durata*: size and shape of buds; size, lobing, and persistence of leaves, and their somewhat convex upper surface; and the color of persistent, dead leaves. Shrubs of *Q. durata* were noted within 100 yards of this clump, although no *Q. Garryana* was observed in the vicinity. A clump of eight small, shrubby trees, apparently referable to this hybrid, were observed about three-eighths of a mile west of Bluff Point, near the end of Tiburon Penninsula (*Tucker 1576, 1577, 1578*). An individual more obviously intermediate between *Q. Garryana* and *Q. durata* occurs beside Ridgecrest Road, about 7.5 miles southwest of Fairfax (*Tucker 1589, 2302*). At this locality *Q. durata* is abundant but no *Q. Garryana* was observed.

Several attempts have been made to obtain acorns from one or another of the hybrids, to determine whether or not seedlings would show segregation of parental characters. The type locality has been visited three different years with uniformly disappointing results. A single mature acorn represents the largest collection made here so far. The shrubby tree beside Ridgecrest Road, in Marin County, has been slightly more rewarding. The largest collection to date, made on the author's initial visit with Mr. Howell, comprised about a dozen mature acorns. Far more abundant were the numerous abortive acorns which had reached various stages of development. An attempt was made to germinate ten of the mature acorns, but only one rather weak seedling was obtained. Although more data are certainly desirable, the available evidence suggests a high degree of sterility in these hybrids. This would scarcely be surprising in a cross between two such widely dissimilar parents. Whatever the fundamental cause of this apparent inviability of the progeny of *Q. subconvexa*—whether it is due to "cryptic structural hybridity" (Stebbins, 1945, 1950) or to some other cause—the deleterious effect is not clearly revealed until after fertilization. This is indicated by the large numbers of small abortive acorns in all stages of development observed on the Ridgecrest Road hybrid. The high percentage of apparently normal fully-developed tetrads and pollen observed in the original hybrid indicates that no appreciable ill effects have resulted up to the latter stage.

On the trip mentioned above, Mr. Howell also pointed out a group of three small shrubby trees near the top of Fish Grade, between Phoenix and Lagunitas lakes (cited by Howell, 1949, as suspected hybrids between *Q. Garryana* and *Q. dumosa*)? These individuals are described as hybrids as follows:

Quercus × Howellii hybr. nov. *Q. dumosa* Nutt. × *Q. Garryana* Dougl.) Arbor parva arbuscula usque ad 5.5 m. alta

ramulis pallide brunneis aliquanto sparse tomentulosis alabastris ovoideis vel sphaeroideo-ovoideis puberulentis vel glabratis pallide rubro-brunneis 3-6 mm. longis foliis (an denique?) deciduis in ambitu ellipticis vel obovatis 4 - 10 cm. longis 2 - 6 cm. latis basi cuneatis attenuatis vel rotundatis plerumque inaequalibus margine inaequaliter ac haud profunde lobatis vel dentibus vel lobis plerumque mucronatis crasse dentatis paginis superioribus nitidis atroviridibus eis inferioribus pallide veridibus hic haud nitidis pilis brevissimis puberulentis cupulis valde vel leviter patelliformibus 14 - 18 mm. latis 5 - 8 (plerumque 6) mm. profundis glandibus ovoideis vel ellipsoideis 20 - 30 mm. longis 13 - 19 mm. latis.

Small tree to 5.5 meters in height. Twigs of the current year's growth 1.5 - 3 mm. in diameter, light brown and rather sparsely tomentulose with small, light-colored lenticels. Buds 3-6 mm. long, ovoid to round-ovoid, puberulent and with the margins of the scales ciliate, to glabrate, light reddish-brown in color. Stipules mostly caducous, to 8 mm. long, oblong to linear, sparsely puberulent on dorsal surface, light brown in color. Leaves deciduous (tardily?), elliptical to obovate in outline, 4-10 cm. long, 2-6 cm. broad, base cuneate, attenuate, or rounded, often unequal, irregularly shallowly lobed or coarsely toothed, the apices of teeth or lobes usually mucronate, upper surface dark green and shiny, sparsely stellate-puberulent to glabrate, lower surface light green and dull, very short-puberulent; secondary veins mostly 6-8 on a side; petiole 3-10 mm. long, puberulent. Staminate catkins not seen. Acorn cups saucer-shaped to shallow cup-shaped, 14-18 mm. broad, 5-8 (mostly about 6) mm. high, scales narrowly ovate or lanceolate, minutely puberulent, bases of the scales with pronounced but small tubercles, the tips sometimes more or less ligulate; acorn ovoid to ellipsoid, 20-30 mm. long, and 13-19 mm. broad, brown and glabrate.

Type. Near top of Fish Grade, between Phoenix Lake and Lake Lagunitas, Marin County, California, August 31, 1947, *Tucker 1591* (University of California Herbarium no. 938397).

Other collections examined. Type locality: August 31, 1947, *Tucker 1592, 1593*.

These shrubby trees resembled *Q. Garryana* in having rather large leaves with dark green, shiny upper surfaces, and one which bore fruit had shallow, saucer-shaped acorn cups closely resembling those of the latter species. They were obviously not conspecific, however; the leaves were, in general, smaller than in *Q. Garryana,* and coarsely toothed, or at most shallowly lobed. Moreover, the lobes or teeth had distinctly mucronate apices.

As in the preceding case, it seemed likely that these individuals were hybrids between *Q. Garryana* and a shrubby, evergreen, white oak with small, mucronately toothed leaves.

In this case the few shrubby oaks in the vicinity were not *Q. durata,* but *Q. dumosa,* and in several morphological characters these trees resemble the latter rather than the former:

1. The leaves are not convex above, but plane.
2. The stellate hairs of the lower leaf surfaces are quite short— definitely shorter than those of either *Q. durata* or *Q. Garryana.*
3. The branchlets of the current year's growth are sparsely to moderately puberulent with very short hairs.
4. The buds, in shape and color, are quite similar to those of *Q. dumosa,* but are considerably larger, approaching the size of those of *Q. Garryana.*

Staminate flower buds were collected March 8, 1953 for study of meiosis. The haploid chromosome number was found to be twelve.

The largest of these three individuals—a small, shrubby tree about 18-20 feet tall—bore a few mature (or nearly mature) acorns, although no abortive ones were observed on the tree. An attempt was made to germinate 18 of these, but no seedlings were obtained. It may well be that this hybrid is highly sterile, as seems to be the case in *Quercus* × *subconvexa.* As in the latter this would not be surprising, for *Q. dumosa* is scarcely, if at all, any more closely related to *Q. Garryana* than is *Q. durata.*

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NOTES AND NEWS

ASPLENIUM VIRIDE IN CALIFORNIA. While rock climbing in the Sierra Buttes, Sierra County, California, on July 26, 1953, I noticed in the crevices of a vertical cliff below which we were traversing a little fern which looked familiar to me from my collecting trips in northern New England. On closer inspection it proved to be without doubt the green spleenwort, *Asplenium viride* Huds. The plants were lodged deep in the crevices of the rock, so that they could not have been removed without the aid of a long knife, and at the beginning of a new rock climbing route of unknown difficulty one is not inclined to linger over plant collecting. I therefore removed a few fronds and placed them in my wallet. Upon returning to camp, I was surprised to find that the species is not listed at all in Jepson's manual. The following week, I consulted Dr. E. B. Copeland at the University of California Herbarium, who kindly verified the identification for me, and determined that no specimens of *A. viride* from California exist, and no published records of its occurrence in our state could be found.

Asplenium viride is a widespread holarctic fern, which on the Pacific Coast is frequent on moist, shady cliffs at relatively high altitudes as far south as Washington. It is listed by M. E. Peck in his flora of Oregon, although the absence of specimens from that state in the University of California Herbarium indicates that it is rare there. In the Rocky Mountain region, *A. viride* extends southward to Wyoming and northern Utah, and it has been found by Holmgren in the Ruby Mountains of northeastern Nevada. The Sierra Buttes locality is not only a new record for California, but also marks the southernmost outpost of this fern in North America. A specimen (*Stebbins 5219*) has been deposited in the Herbarium of the University of California. G. LEDYARD STEBBINS, JR.

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A series of excellent biographical sketches of early California botanists, authored by Edmund C. Jaeger, is appearing in "Calico Print," a bi-monthly magazine devoted to "tales and trails of the desert West" and edited by Harold and Lucile Weight at Twenty-nine Palms, California. An account of Marcus E. Jones was included in the October-November 1952 issue and of Katherine Brandegee in the March 1953 number.